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The Evolution of Blockchain: A Bibliometric Study

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ABSTRACT Blockchain as emerging technology is revolutionizing several industries, and its abundant privileges have opened up a bunch of research directions in various industries; thereby, it has acquired many interests from the research community. The rapid evolution of blockchain research papers in recent years has resulted in a need to conduct research studies that investigate a detailed analysis of the current body of knowledge in this field. To address this need, a few review papers have been published to report the latest accomplishments and challenges of blockchain technology from different perspectives. Nonetheless, there has not been any bibliometric analysis of the state of the art in blockchain where Web of Science (WoS) has been taken into consideration as a literature database. Hence, a thorough analysis of the current body of knowledge in blockchain research through a bibliometric study would be needed. In this paper, we performed a bibliometric analysis of all Blockchain's conference papers, articles, and review papers that have been indexed by WoS from 2013 to 2018. We have analyzed those collected papers against five research questions. The results revealed some valuable insights, including yearly publications and citations trends, hottest research areas, top-ten influential papers, favorite publication venues, and most supportive funding bodies. The findings of this paper offer several implications that can be used as a guideline by both fresh and experienced researchers to establish a baseline before initiating a blockchain research project in the future.

INDEX TERMS Blockchain, bibliometric study, Web of Science.

I. INTRODUCTION

Since the innovation of Bitcoin, a digital cryptocurrency, in 2008 [1], Blockchain technology has positioned itself in the focal point of interest among a diverse range of researchers and practitioners. Blockchain is a decentralized ledger that stores all transactions that have been made on top of a peer-to-peer network in a secure, verifiable and transparent way. The main advantage of Blockchain over the existing technologies is that it enables the two parties to make transactions over the Internet securely without interference of any intermediary party. The omission of the third party can reduce the processing cost while improving the security and efficiency of transactions.

Due to the considerable amount of benefits that Blockchain can bring in every industry, its significance level has been compared to the role of the Internet in the early 1990s [2]. Blockchain is revolutionizing various industries, ranging from finance [3]–[5], Internet of Things (IoT) [6]–[11], healthcare [12]–[14], reputation systems [15]–[17], and supply chain management [18], [19]. It is worth mentioning that technology companies and financial services invested over $1 billion only in 2016 into deploying Blockchain and it is quite predictable that this amount will be increasing dramatically over the next few years [20].

The rapid growth of Blockchain technology over the recent years has opened up a plenty of research gaps and directions for the research community. As a result, a remarkable amount of research endeavors have been conducted within the domain of Blockchain in recent years [21]–[23]. Based on our data, more than 1000 scientific papers have been indexed only by Web of Science (WoS) in recent years. As the number of research publications in the Blockchain domain is increasing, there is a demand for conducting research studies in which a comprehensive overview of the current body of knowledge in this field is investigated. To fulfill this demand, a few review papers have been published in order to provide the researchers and practitioners with the recent achievements and challenges in the Blockchain community [24]–[34]. There is, nevertheless, no bibliometric analysis of the state-of-the-art

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in Blockchain domain reported yet in which WoS has been considered as a literature database. Hence, to maintain the steady progress in this area, a detailed bibliometric study of the recent scientific papers in the Blockchain domain is a necessity with the aim of discovering meaningful information to the Blockchain research community.

The main objective of this paper is to systematically collect, characterize and analyze all the Blockchain research papers that have been indexed by WoS Core Collection. To attain the desired objective, we conducted a bibliometric study of the Blockchain literature with the aim of revealing some valuable insights to the active scholars and practitioners in the Blockchain discipline. To the best of the authors' knowledge, this paper delineates the first endeavor in the WoS literature toward conducting an extensive bibliometric analysis of the current body of knowledge in the Blockchain domain. The results extracted from the bibliometric study presented in this paper would disseminate i) annual publications and citations trends; ii) trendiest research areas; iii) top-ten highly cited papers; iv) most popular publication venues; v) and most supportive funding agencies of Blockchain researches.

The remainder of this paper is organized as follows. Section II describes the research methodology carried out in this research, including the formulated research questions. Section III presents the detailed results extracted from conducting the bibliometric study. Section IV provides a discussion on the results. Section V discusses the possible threats to validity of results. Section VI provides an overview of few existing bibliometric studies of Blockchain research. Ultimately, Section VII concludes this research and outlines the future work.

II. RESEARCH METHODOLOGY

This section elaborates a number of consecutive steps required to be carried out throughout this research.

A. FORMULATION OF RESEARCH QUESTIONS

As mentioned earlier, the main goal of this research is to conduct a bibliometric analysis of all Blockchain papers that are indexed by WoS Core Collection. To achieve this goal, we set out to answer the following research questions:

RQ1: What is the distribution of Blockchain publications and citations over the recent years?

Answering RQ1 would help us to determine the yearly volume of Blockchain publications and citations trends, which in turn can be helpful to predict the future pattern.

RQ2: Which research areas have been mostly investigated in Blockchain based on the number of publications?

Answering RQ2 would enable researchers to understand how much research effort has been invested into every area of Blockchain. This can also help them to identify the future research directions.

RQ3: What are the most influential papers in Blockchain according to the number of citations?

Answering RQ3 would facilitate the researchers and practitioners to gain insight on which papers have received most attention within the Blockchain community. This would be beneficial to find out what kind of research studies and methods may lead to produce a high-quality research work and thereby would impress the Blockchain community.

RQ4: What are the most popular publication venues for Blockchain papers?

Answering RQ4 would help Blockchain researchers to make proper decision on which journals and conferences they can choose to publish their research outcomes. Such kind of decision may also affect the number of paper's citations in future.

RQ5: What are the topmost supportive funding agencies of Blockchain papers?

Answering RQ5 would enable researchers and practitioners to understand which institutions or organizations are investing more on the Blockchain domain. This provides them with the opportunity to initiate any research collaboration or to apply for a Blockchain-related position.

B. DATA EXTRACTION

Prior to collecting Blockchain papers, we needed to select an appropriate search engine, which is capable of accommodating our needs. Among the other existing scientific databases such as Scopus and Google Scholar, the current research has selected WoS Core Collection (hereafter referred to as WoS for the sake of simplicity) as a data source of Blockchain published papers. This selection was made because i) WoS stands as the world's leading scientific citation index; ii) it has a rigorous selection process which leads to high-quality and influential research publications; iii) by covering more than 20,300 prestigious journals, conference proceedings, and books, WoS has been widely well-respected among academicians over the years; iv) and it provides the researchers with some useful analytical features.

After choosing WoS as the search engine of this study, we identified some related terms such as 'Blockchain', 'bitcoin', 'cryptocurrency', 'ethereum', and 'smart contract' as query string to start the process of extracting papers. Fig. 1 illustrates the initial results of our findings where we can see the yearly publication trends of each selected query string. Note that this search was done on November 24, 2018.

According to Fig. 1, the number of publications related to Bitcoin has been growing continuously since proposing Nakamoto's paper in 2008. However, in recent three years, from 2016 to 2018, we see a significant change in publication trends where Blockchain has started to receive more attention from researchers compared to the other topics. Based on our findings, 491 and 483 research items related to Blockchain have been indexed by WoS in 2017 and 2018, respectively. Table 1 gives a detailed overview of our findings.

The results provided in Table 1 show the significance of Blockchain-related researches and thereby motivated us to choose 'Blockchain' as our search query string. Our search

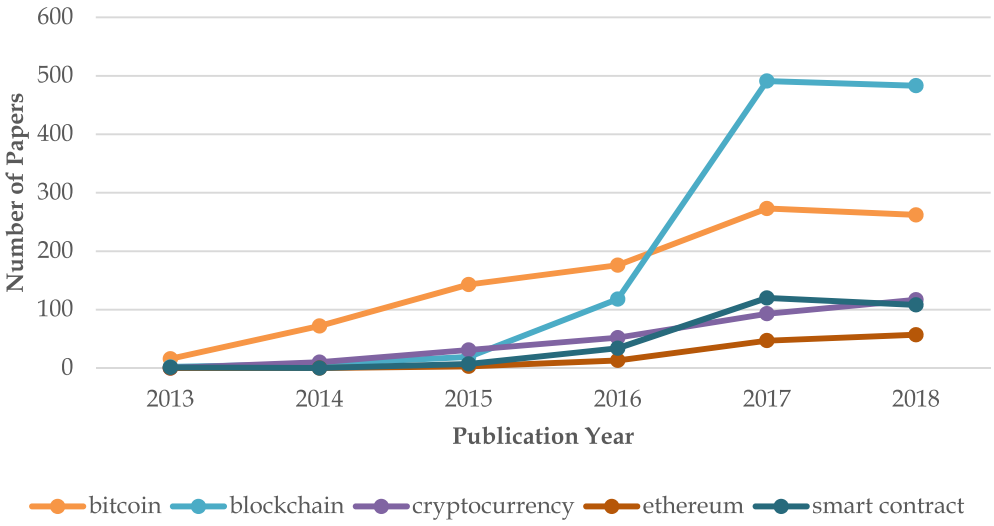

FIGURE 1. Yearly publication trends of different topics.

TABLE 1. Number of publications for each topic per year.

	2013	2014	2015	2016	2017	2018	Total
bitcoin	16	72	143	176	273	262	942
blockchain	2	7	19	118	491	483	1120
cryptocurrency	0	10	31	52	93	117	303
ethereum	0	0	3	13	47	57	120
smart contract	1	0	7	34	120	108	270

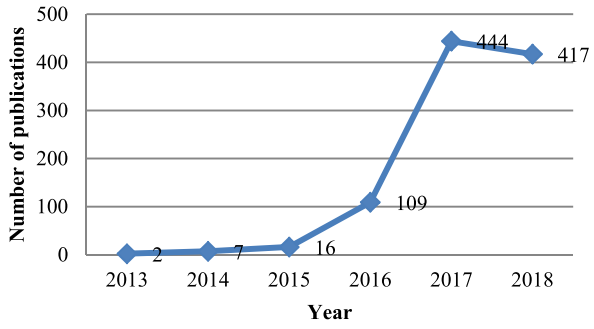

FIGURE 2. Number of blockchain papers indexed by WoS per year.

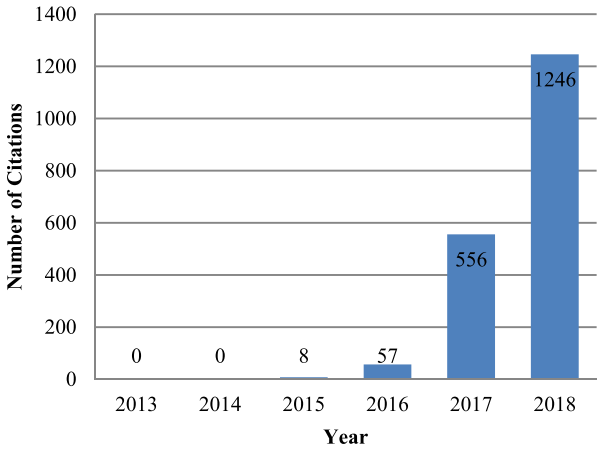

FIGURE 3. Yearly number of citations to blockchain papers.

string targeted the three parts of each paper, namely title, abstract, and keywords. As the first Blockchain paper was published in 2013, we chose the time span of 2013 to 2018 for our search process. Consequently, 1120 research papers including 510 proceedings papers, 494 articles, 64 editorial materials, 26 reviews, 11 news items, 9 meeting abstracts, and 6 letters were retrieved from WoS on November 24, 2018. After a quick screening of the retrieved papers, we decided to include only conference proceedings (510 papers), articles (494 papers), and reviews (26 papers). During the pilot study, we found some duplicate papers and more news items. After excluding those redundant papers, ultimately, we constructed our final dataset including 995 papers.[1]

C. DATA ANALYSIS

After retrieving and selecting papers, we started to perform descriptive analysis, focusing on finding answerers to the research questions we formulated in the preceding section.

[1]Dataset is available at https://bit.ly/2rszdAy

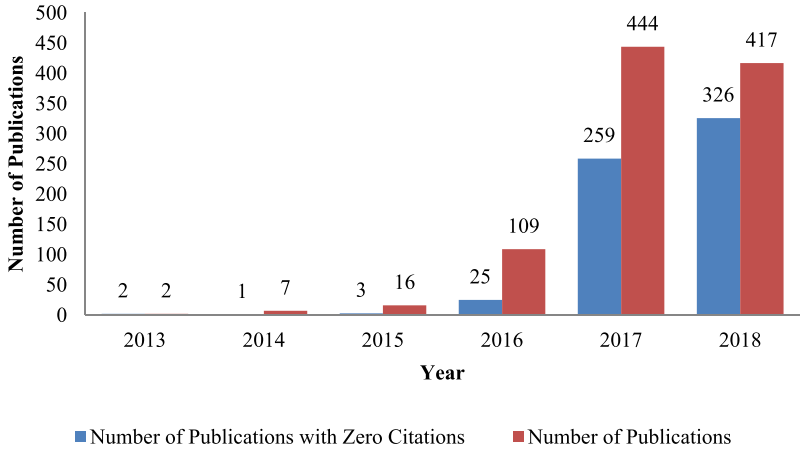

FIGURE 4. Annual comparison between number of non-cited papers and total number of papers.

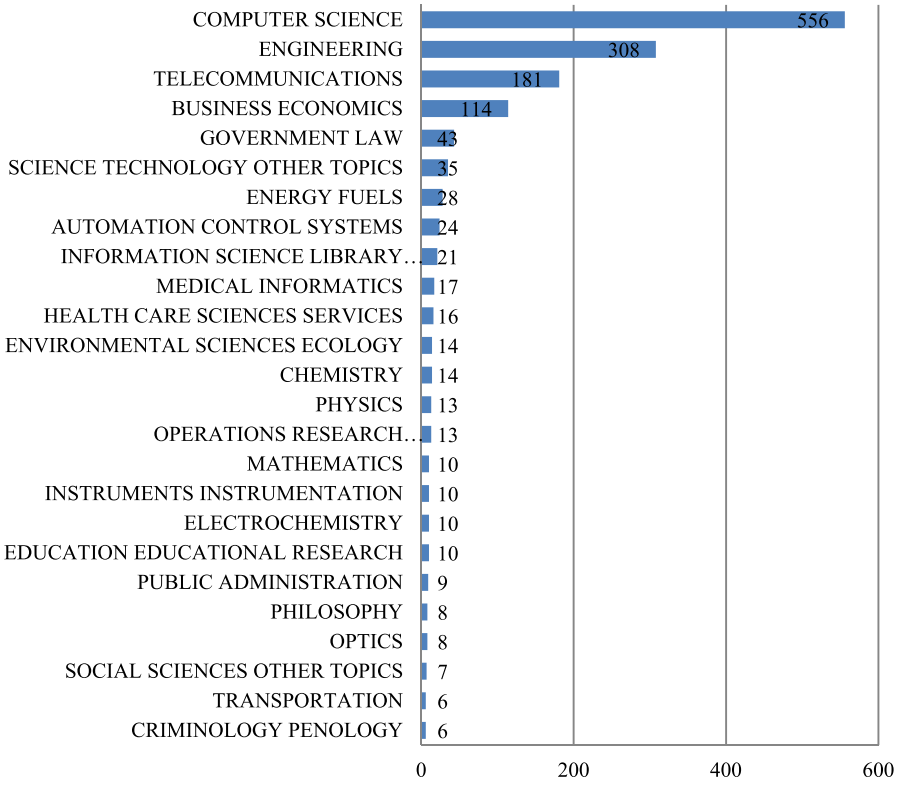

FIGURE 5. Research area coverage of Blockchain papers indexed by WoS.

III. RESULTS

A. RQ1: WHAT IS THE DISTRIBUTION OF BLOCKCHAIN PUBLICATIONS AND CITATIONS OVER THE RECENT YEARS?

Some insights can be obtained by observing the Fig. 2 and Fig. 3 where the publication and citation trends of Blockchain papers are presented. From Fig. 2, we can see that the yearly number of Blockchain papers is growing rapidly in recent years. It started in 2013 by publishing only two papers and reached to the maximum number of papers in 2017 and 2018 where more than 400 papers have been published in each year.

By increasing the number of published papers in Blockchain domain, we expected to see an increasing trend with respect to the number of citations. This hypothesis is confirmed by the results sketched in Fig 3. We see the first citations in 2015 where there were only eight citations. This is followed by 57 citations in 2016. Nevertheless, since 2017 we see a drastic change in the number of citations (556 and 1246 citations in 2017 and 2018 respectively) to

the Blockchain papers that are indexed by WoS. We also analyzed those papers that have not received any citation yet. Fig. 4 provides a yearly comparison between the number of papers with zero citations and the total number of published papers. Based on our results, out of all 995 Blockchain papers that are indexed by WoS in 2013 to 2018, 616 papers (∼62%) have received no citations yet. Although these results initially do not give a good impression, a careful look at the results implies that 585 papers without any citation (∼95% of all non-cited papers) have been published in 2017 and 2018. This is predicable due the strict selection process of WoS-indexed publications and thereby it causes a paper to be cited a bit late. It is also worth highlighting that an analysis of highly cited papers is elaborated in more detail in Section III.C.

B. RQ2: WHICH RESEARCH AREAS HAVE BEEN MOSTLY INVESTIGATED IN BLOCKCHAIN BASED ON THE NUMBER OF PUBLICATIONS?

In this section, we classified all retrieved Blockchain papers based on different research areas that are introduced by WoS.[2] Fig. 5 ranks the various research areas based on total number of Blockchain papers that belong to each research area. As can be seen in Fig. 5, Computer Science has been covered by the most number of Blockchain papers, i.e. 556 papers, followed by Engineering, Telecommunications, and Business Economics with 308, 181, and 114 papers, respectively. It should be noted that each paper might cover more than one research area.

Furthermore, we evaluated the research areas, those with more than 100 coverage rate, based on the number of citations. Here, we also observed the same pattern as Computer Science obtained the most number of citations with 1246, followed by Engineering with 613 citations, Telecommunications with 495 citations, and Business Economics with 138 citations.

C. WHAT ARE THE MOST INFLUENTIAL PAPERS IN BLOCKCHAIN ACCORDING TO THE NUMBER OF CITATIONS?

Table 2 lists the ten most cited Blockchain papers indexed by WoS. These papers are also ranked based on the average number of citations per year (as shown in the most right column of Table 2). Among others, paper titled ''Blockchains and Smart Contracts for the Internet of Things'' written by Konstantinos Ch. and Michael D. has been identified as the most cited paper with 122 citations (to the date of conducting this research). This paper was published in the IEEE Access journal in 2016. This paper has also gotten the highest average number of citations per year. Five out of ten most cited papers were conducted in the USA. The journal of IEEE Access has published the two of highly cited papers based on the average number of citations per year.

[2]https://images.webofknowledge.com/WOK48B3/help/WOS/hp_research_areas_easca.html

D. RQ4: WHAT ARE THE MOST POPULAR PUBLICATION VENUES FOR BLOCKCHAIN PAPERS?

Table 3 represents the popular venues that have published at least ten papers in the Blockchain domain. Lecture Notes in Computer Science and IEEE Access have proven themselves as the most popular venues by publishing 50 and 43 papers, respectively. To measure the impact of each venue on the Blockchain research community, we evaluated those short-listed venues based on other factors such as total number of citations, without self-citations, average citations per paper, and H-index. The results show that IEEE Access has outperformed others in terms of total number of citations.

E. RQ5: WHAT ARE THE TOPMOST SUPPORTIVE FUNDING AGENCIES OF BLOCKCHAIN PAPERS?

Among all 995 papers we analyzed in this research, National Natural Science Foundation of China (NSFC) has supported the most number of papers with 100 papers. Then, 36 papers have been supported by National Key Research and Development Program of China while National Science Foundation of USA (NSF) has supported 15 papers. Fig. 6 represents the detailed information about the supportive funding organizations. We also evaluated those funding agencies based on total number of citations that their supported papers received. Accordingly, as shown in Fig. 6, papers that were supported by NSFC have received more citations, i.e. 177 citations, compared to the others.

IV. DISCUSSION

According to the results presented in the preceding section, this section provides a discussion on the conceivable phenomena that might describe the trends observed in analysis and comparisons.

A close observation of publication trends indicates that Blockchain has opened up a bunch of research directions in various industries and thereby received many interests by the researchers in recent years (more specifically since 2016). Analysis of citation trends confirms the impact of Blockchain on the research community. This information can be used as a guideline by young researchers to be aware of trends before initiating a research work.

Although most of published papers have covered the four underlying research areas of Blockchain (Computer Science, Engineering, Telecommunications and Business Economics), exploration of results implies the potentiality of Blockchain to be applied to a diverse range of research areas. Therefore, the results not only show the trendy research areas but also discover the opportunities for new lines of research.

An in-depth observation of highly cited papers reveals an abundance of useful information. For the young researchers, it provides them with rigorous guidelines to understand what major characteristics (such as research methodology, results, structure, and evaluation) make a paper popular among others. It would be also helpful for them to improve their technical writing style. It also helps both fresh and experienced

TABLE 2. Overview of top 10 cited blockchain papers.

Title	Authors	Source	Country	Institution (of first author)	Year	Citations	Yearly average citations
Blockchains and Smart Contracts for the Internet of Things [35]	Christidis, Konstantinos; Devetsikiotis, Michael	IEEE ACCESS	USA	North Carolina State University	2016	122 (#1)	40.67 (#1)
Decentralizing Privacy: Using Blockchain to Protect Personal Data [36]	Zyskind, Guy; Nathan, Oz; Pentland, Alex 'Sandy'	IEEE Security and Privacy Workshops	USA	Massachusetts Institute of Technology	2015	84 (#2)	21 (#5)
Hawk: The Blockchain Model of Cryptography and Privacy-Preserving Smart Contracts [37]	Kosba, Ahmed; Miller, Andrew; Shi, Elaine; Wen, Zikai; Papamanthou, Charalampos	IEEE Symposium on Security and Privacy	USA	University of Maryland College Park	2016	66 (#3)	22 (#3)
Majority Is Not Enough: Bitcoin Mining Is Vulnerable [38]	Eyal, Ittay; Sirer, Emin Guen	International Conference on Financial Cryptography and Data Security	USA	Cornell University	2014	53 (#4)	10.6 (#12)
Bitcoin and Beyond: A Technical Survey on Decentralized Digital Currencies [39]	Tschorsch, Florian; Scheuermann, Bjoern	IEEE COMMUNICATIONS SURVEYS AND TUTORIALS	Germany	Humboldt University of Berlin	2016	44 (#5)	14.67 (#6)
Where Is Current Research on Blockchain Technology?-A Systematic Review [40]	Yli-Huumo, Jesse; Ko, Deokyoon; Choi, Sujin; Park, Sooyong; Smolander, Kari	PLOS ONE	Finland	Lappeenranta University of Technology	2016	35 (#6)	11.67 (#9)
Bitcoin-NG: A Scalable Blockchain Protocol [41]	Eyal, Ittay; Gencer, Adem Efe; Sirer, Emin Gun; van Renesse, Robbert	USENIX Symposium on Networked Systems Design and Implementation	USA	Cornell University	2016	35 (#6)	11.67 (#9)
An ID-Based Linearly Homomorphic Signature Scheme and Its Application in Blockchain [42]	Lin, Qun; Yan, Hongyang; Huang, Zhengan; Chen, Wenbin; Shen, Jian; Tang, Yi	IEEE ACCESS	China	Hanshan Normal University	2018	29 (#7)	29 (#2)
Blockchain technology in the chemical industry: Machine-to-machine electricity market [43]	Sikorski, Janusz J.; Haughton, Joy; Kraft, Markus	APPLIED ENERGY	England	University of Cambridge	2017	29 (#8)	14.5 (#7)
Healthcare Data Gateways: Found Healthcare Intelligence on Blockchain with Novel Privacy Risk Control [44]	Yue, Xiao; Wang, Huiju; Jin, Dawei; Li, Mingqiang; Jiang, Wei	JOURNAL OF MEDICAL SYSTEMS	China	Huaqiao University	2016	28 (#9)	9.33 (#13)

scholars in the process of initiating a research project by identifying the research topics that may receive more attentions from the other researchers. Furthermore, the results highlight some points on which authors, institutions, and countries/regions are producing influential papers in Blockchain domain, thus establishing a baseline for research collaboration. For instance, we observed that American institutions are paying more attention to conduct high-quality Blockchain researches and therefore received more citations or among Asian countries, China is the only country

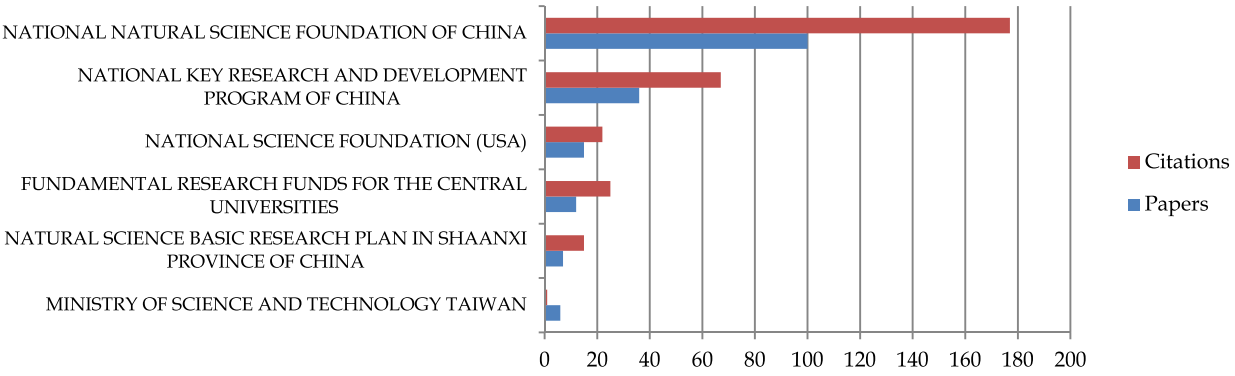

FIGURE 6. Topmost funding agencies of blockchain papers.

that is active in producing highly cited publications in this field.

Choosing a right venue to present the outcomes of a research work is a crucial task for researchers as it might affect the number of citations in future studies. This shows the importance of analyzing the possible venues for publishing Blockchain researches. It has been found that Lecture Notes in Computer Science and IEEE Access have been recognized as the most popular venues for the publication of new contributions in Blockchain domain (see Section III.D). However, as Lecture Notes in Computer Science covers some subseries and conference proceedings, we can conclude that IEEE Access, as a single multidisciplinary journal, is the most popular venue to publish Blockchain's latest research findings. Another interesting point that advocates the popularity of IEEE Access over others is that it has received the highest number of citations of Blockchain papers so far.

The observations regarding the topmost funding organizations imply that China has proven itself as one of the major investing countries on Blockchain research studies. The quality of Blockchain researches, which were supported by Chinese funding bodies, especially NSFC, is affirmed according to the number of citations they received compared to other funding agencies. Such kind of information would quite useful for researchers and practitioners who are interested to apply for a Blockchain-related position. It can also give directions to the university professors before lodging a grant application.

V. THREATS TO VALIDITY

This section discusses the possible threats that could affect the validity of our results. We also explain about the actions that we have performed to alleviate the effect of those threats.

One threat was related to the selection process of papers, as there was a possibility of including some irrelevant or duplicate papers in the final dataset. We tried to minimize the effect of this threat by employing a methodological process, thereby excluding non-related papers such as news items, letters, and so on. We also manually screened the initial dataset to find duplicate papers. Consequently, we have detected and excluded some repetitive papers.

The other threat concerned with the identification of topmost supportive funding agencies. After extracting the different funding agencies and the number of papers each funding agency supported, we have figured out that although some papers were supported from the same funding body, the reported names in the acknowledgments were different. For example, some papers used the abbreviation instead of putting the complete name of funding organization. To mitigate this threat, we searched for every abbreviation separately on the Internet to find the identical names. Ultimately, we consolidated the number of papers with identical names before reporting the results. The only threat that was difficult to be minimized referred to the fact that some authors did not include the name of funding agencies even though the papers were supported.

Another issue that needs to be discussed is whether the outcomes of this study can be generalized to the external literature sources, such as Scopus or Google Scholar. Although it challenging to conclude that the findings of this research can be generalized outside the scope of this study, we have selected WoS as the literature database, considering the fact that most of the papers, which are indexed by WoS, have been indexed by Scopus and Google Scholar as well. However, the rigorous, transparent and systematic approach that we have followed in this research would enable the other researchers to replicate the same bibliometric study, considering different literature databases. Conducting such replication studies could be useful to discover whether the findings of this research have universal scope or not.

As this research dealt with performing quantitative analysis of retrieved papers, most probably human errors might happen especially when complex statistical calculations are performed manually. Hence, this could have threatened the validity of our results. To keep away from such kind of threat, all calculations were done automatically using Microsoft Excel. All calculations were then double-checked by the second author to ensure the reliability of results.

VI. RELATED WORK

This section aims at reviewing a few bibliometric studies that have been conducted recently by the other researchers to

TABLE 3. Most popular venues for blockchain papers.

	Publications	Citations	Without Self-Citations	Average Citations Per Paper	H-Index
Lecture Notes in Computer Science	50 (#1)	184 (#2)	173	3.68	6
IEEE Access	43 (#2)	224 (#1)	199	5.21	6
9th International Conference on New Technologies Mobility and Security	14 (#3)	-	-	-	-
Strategic Change Briefings in Entrepreneurial Finance	11 (#4)	12 (#4)	8	1.09	2
Journal Of Medical Systems Sensors	10 (#5)	30 (#3)	26	3	1
SENSORS	10 (#6)	10 (#5)	7	1	1

TABLE 4. An overview of existing bibliometric studies of blockchain research.

Ref.	Year	Search Engine	Time Span	No. of Analyzed Papers	Remarkable Findings
[45]	2018	Scopus	2008-2017	801 papers	• USA has been identified as the most productive country. • PLOS ONE, Economist United Kingdom, and Communications of The ACM were the most popular publication venues • Eidgenossische Technische Hochschule Zurich in Switzerland has been recognized as the most productive institution. • "Bitcoin meets Google Trends and Wikipedia: Quantifying the relationship between phenomena of the Internet era" has been known as the most citied journal paper. • Bouri, E., from the USEK Business School of Lebanon has been known as the most productive author.
[46]	2018	Ei Compendex (EI), China National Knowledge Infrastructure (CNKI)	2011-2017	970 papers including 473 papers for EI and 497 papers for CNKI	• CNKI authors and institutions showed a better performance compared to EI. • Since 2017, researchers have paid more attention to Blockchain compared to Bitcoin. • ETH in Zurich and Industrial & Commercial Bank of China were known as the most productive institutions by EI and CNKI, respectively.

evaluate the research trends of Blockchain. Considering different literature search engines and diverse time span, these studies focused on analyzing various aspects of Blockchain papers such as authors' productivity, yearly publication trends, citation analysis, and so forth.

In [45], Miau and Yang investigated the growth of literature and productivity of authors in Blockchain research in the period of 2008 to early 2017. They utilized Scopus as the search engine to collect and analyze research papers. Their results showed an increasing trend in the number of Blockchain papers since 2016. They also explored and listed the top-ten authors based on the total number of publications. A summary on the findings of this research is described in Table 4.

In another study [46], the researchers considered two scientific databases, namely Ei Compendex (EI), and China National Knowledge Infrastructure (CNKI) to conduct a bibliometric analysis of Blockchain literature in the period

of 2011 to September 2017. They found a better productivity of CNKI's authors /institutions over EI. However, in terms of research collaboration, EI outperformed CNKI. It has been also acknowledged that the researchers have altered their interests from Bitcoin to the Blockchain since 2017.

Table 4 presents a review on the bibliometric analyses of the state-of-the-art in Blockchain, which in turn inspired this research. An in-depth exploration of the existing bibliometric studies alludes that none of the researches has considered WoS as a search engine to discover consequential information behind Blockchain research papers. This stimulated us to investigate a thorough analysis of the current body of knowledge in Blockchain research, through a bibliometric study. Towards this end, this research noticeably differs from the two current bibliometric studies reported in the literature on Blockchain, thereby would provide significant findings to the Blockchain research community.

VII. CONCLUSIONS AND FUTURE WORK

In this research, we presented a thorough explanation of a bibliometric analysis on Blockchain domain. Totally, 995 papers were retrieved from WoS while covering the time span of 2013 to 2018.

Analysis of results extracted from the bibliometric study indicated that researchers have shifted their research interests from Bitcoin to Blockchain in the recent past two years. To complement this, the number of citations to Blockchain papers has been also growing drastically since 2017 and most probably, this incremental trend would be continuing in the next years as well. Four research areas, namely Computer Science, Engineering, Telecommunications and Business Economics, have been covered by most of the Blockchain papers. Based on our findings, the most cited paper titled ''Blockchains and Smart Contracts for the Internet of Things'' written by Konstantinos Ch. and Michael D. was published in 2016 in the journal of IEEE Access. This paper has also received the highest average citations per year. Lecture Notes in Computer Science and IEEE Access have shown themselves as the most popular venues, based on total number of publications, for publishing the latest advancements in the Blockchain area. However, Blockchain papers published in IEEE Access have impressed the research community more than others as they received the highest number of citations. The results indicated that National Natural Science Foundation of China has made sound investments on Blockchain research by supporting the highest number of papers indexed in WoS.

Overall, this paper has made the following key contributions:

- Primarily, this research reports the first endeavour in the WoS literature toward conducting a thorough bibliometric analysis of the current body of knowledge in the Blockchain domain.
- Second, analysis of results extracted from the bibliometric study highlights some significant implications to the interested researchers before pursuing further investigations in this field of research.

This study opens up a few lines of research as future work. It would be worth conducting detailed research on the technical aspects of the highly cited papers reported in this research. Furthermore, it would be of interest to replicate the same bibliometric study but on different literature database such as Scopus to investigate how the results would be similar with the findings of this study.

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